

OUR ASTRONOMICAL COLUMN.

THE LEONID METEORS.—As was anticipated, the Leonid meteors failed to appear in any numbers last week. In a letter to the *Times*, Mr. W. H. M. Christie, the Astronomer Royal, states that a watch was kept at the Royal Observatory on the nights of November 13-14, 14-15 and 15-16, but comparatively few Leonids were seen. The following is a statement of the number of meteors noted by three observers on the three nights in question:—

	Length of watch.	Total number of meteors.	Number of Leonids.
November 13-14	5 hours	25	5
„ 14-15	2 „	20	6
„ 15-16	4½ „	55	23

It will be seen that there was nothing in the nature of a shower of Leonids.

Mr. E. C. Willis, writing from Norwich, says:—“Watches for the Leonids were first undertaken on the morning of November 10, and continued at various intervals until the evening of November 16. The total duration of the actual watches was 12½ hours, but a considerable portion of this time was more or less cloudy, and the moon was above the horizon nearly the whole of it. The total number of Leonids recorded was 42, while the other meteors numbered 110. No Leonids were observed before the morning of November 11, or after the morning of November 16, and although it is no doubt very possible that the shower may have extended over a much longer period, it is certain that in that case it must have been of a very weak character.”

“To determine the true maximum of the shower, it is necessary to combine the records of observers from various parts of the earth's surface, so as to obtain a continuous record. The maximum, however, as deduced from my own observations only, decidedly occurred on the morning of November 14. On this occasion the Leonids numbered about two-thirds of all the meteors seen, while on every other occasion they were decidedly in the minority. The hourly rate was about thirteen, but it is evident that many more would have been seen if the conditions had been more favourable, as hardly any of those observed were of less than the second magnitude. This portion of the shower seems to have ended a little before 17h. 30m., as between that time and 18h. none were observed.”

“Perhaps the most remarkable point brought out by the observations was the extraordinary paucity of Leonids on the night of November 15. Watches were kept for 2½ hours at various times between 11h. 15m. and 16h. 15m. In all, 32 meteors were seen, but only two of these were Leonids.”

Prof. J. P. O'Reilly, of Dublin, informs us that on November 13, at about 5.51 p.m., he observed “a shooting star of much brilliancy, which seemed to start from about the Pleiades and to shoot in the direction of the south in a rising direction of about 25° to 30° with the horizon, and being visible over an arc of about 12° to 15°.”

Balloon ascents were made from Paris on the nights of November 14, 15 and 16, but only a few stray meteors were seen.

ELEMENTS OF COMET 1900b (BORRELLY-BROOKS).—Prof. C. D. Perrine gives the following computed elements of this comet in the *Astronomical Journal*, No. 484, vol. xxi. :—

$T = 1900 \text{ August } 3d. \text{ } ^{\circ}20726 \text{ G.M.T.}$

$$\begin{aligned} \omega &= 12^{\circ} 26' 13''.2 \\ \Omega &= 328^{\circ} 0' 30''.1 \\ z &= 62^{\circ} 30' 46''.3 \end{aligned} \quad 1900 \cdot 0$$

$\log. q = 0.006390$

NEW VARIABLE STAR IN LYRA.—Mr. A. Stanley Williams has detected another small variable in Lyra, and in the *Astronomische Nachrichten*, Bd. 153, No. 3671, gives the following co-ordinates for its position:—

$R.A. = 18h. 54m. 22s. \quad (1855^{\circ} 0).$
 $Decl. = +34^{\circ} 45' 5''$

The variation in brightness, as measured from photographs taken with a 4.4 inch portrait lens during the period 1899 September 2 to 1900 October 21, is from 9.3 to 11.0 magnitude. No regular series of observations are given, but the period would appear to be about thirty days.

VISUAL OBSERVATION OF CAPELLA (α-AURIGÆ).—Prof. W. W. Campbell having some time ago discovered that this star was a spectroscopic binary with a period of 104 days, and

the discussion of its parallax with the calculated dimensions of the orbit suggesting the possibility that it might be seen as a visual double star, Prof. W. J. Hussey has made a number of careful examinations of it with the 36-inch Lick telescope. In the *Astronomical Journal*, No. 484, vol. xxi, he furnishes the result of his observations. From the spectroscopic results it was indicated that the most favourable dates of observation would be April 15, June 6 and July 28, as at these times the components would be at their maximum separation. During these observations no evidence of the duplicity of the star could be detected. On August 2 and 5 further examination was made, using powers of 1000, 1500, 1900 and 2600. With all powers the star image appeared round. The “seeing” on these latter days was excellent, and it is considered that any elongation of the image as great as the tenth of a second of arc would have been perceptible even with the lowest power. On one occasion colour screens of various shades were used to reduce the light, but the result was exactly as before.

HUXLEY'S LIFE AND WORK.¹

I ACCEPTED with pleasure the invitation of your Council to deliver the first Huxley lecture, not only on account of my affection and admiration for him and my long friendship, but it seemed also especially appropriate as I was associated with him in the foundation of this Society. He was President of the Ethnological Society, and when it was fused with the Anthropological we, many of us, felt that Huxley ought to be the first President of the new Institute. No one certainly did so more strongly than your first President, and I only accepted the honour when we found that it was impossible to secure him.

But the foundation of our Institute was only one of the occasions on which we worked together.

Like him, but, of course, far less effectively, from the date of the appearance of “The Origin of Species,” I stood by Darwin and did my best to fight the battle of truth against the torrent of ignorance and abuse which were directed against him. Sir J. Hooker and I stood by Huxley's side and spoke up for Natural Selection in the great Oxford debate of 1860. In the same year we became co-editors of the *Natural History Review*.

Another small society in which I was closely associated with Huxley for many years was the X Club. The other members were George Busk, secretary of the Linnean Society; Edward Frankland, president of the Chemical Society; T. A. Hirst; head of the Royal Naval College at Greenwich, Sir Joseph Hooker; Herbert Spencer; W. Spottiswoode, president of the Royal Society; and Tyndall. It was started in 1864, and nearly nineteen years passed before we had a single loss—that of Spottiswoode; and Hooker, Spencer and I are now, alas! the only remaining members. We used to dine together once a month, except in July, August and September. There were no papers or formal discussions, but the idea was to secure more frequent meetings of a few friends who were bound together by common interests and aims, and strong feelings of personal affection. It has never been formally dissolved, but the last meeting was in 1893.

In 1869 the Metaphysical Society, of which I shall have something more to say later on, was started.

From 1870 to 1875 I was sitting with Huxley on the late Duke of Devonshire's Commission on Scientific Instruction; we had innumerable meetings, and we made many recommendations which are being by degrees adopted.

I had also the pleasure of spending some delightful holidays with him in Switzerland, in Brittany, and in various parts of England. Lastly, I sat by his side in the Sheldonian Theatre at the British Association meeting at Oxford, during Lord Salisbury's address, to which I listened with all the more interest knowing that he was to second the vote of thanks, and wondering how he would do it. At one passage we looked at one another, and he whispered to me, “Oh, my dear Lubbock, how I wish we were going to discuss the address in Section D instead of here!” Not, indeed, that he would have omitted any part of his speech, but there were other portions of the address which he would

¹ The first “Huxley Memorial Lecture” of the Anthropological Institute, delivered on November 13, by the Rt. Hon. Lord Avebury, F.R.S., D.C.L., LL.D.

have been glad to have criticised. I was therefore for many years in close and intimate association with him.

Huxley showed from early youth a determination, in the words of Jean Paul Richter, "to make the most that was possible out of the stuff," and this was a great deal, for the material was excellent. He took the wise advice to consume more oil than wine, and, what is better even than midnight oil, he made the most of the sweet morning air.

In his youth he was a voracious reader, and devoured everything he could lay his hand on, from the Bible to Hamilton's "Essay on the Philosophy of the Unconditioned." He tells us of himself that when he was a mere boy he had a perverse tendency to think when he ought to have been playing.

Considering how preeminent he was as a naturalist, it is rather surprising to hear, as he has himself told us, that his own desire was to be a mechanical engineer. "The only part," he said, "of my professional course which really and deeply interested me was physiology, which is the mechanical engineering of living machines; and, notwithstanding that natural science has been my proper business, I am afraid there is very little of the genuine naturalist in me; I never collected anything, and species work was a burden to me. What I cared for was the architectural and engineering part of the business; the working out the wonderful unity of plan in the thousands and thousands of diverse living constructions, and the modifications of similar apparatus to serve diverse ends."

In 1846 Huxley was appointed naturalist to the expedition which was sent to the East under Captain Owen Stanley in the *Rattlesnake* and good use indeed he made of his opportunities. It is really wonderful, as Sir M. Foster remarks in his excellent obituary notice in the Royal Society's *Proceedings*, how he could have accomplished so much under such difficulties.

"Working," says Sir Michael Foster, "amid a host of difficulties, in want of room, in want of light, seeking to unravel the intricacies of minute structure with a microscope lashed to secure steadiness, cramped within a tiny cabin, jostled by the tumult of a crowded ship's life, with the scantiest supply of books of reference, with no one at hand of whom he could take counsel on the problems opening up before him, he gathered for himself during those four years a large mass of accurate, important and, in most cases, novel observations, and illustrated them with skilful, pertinent drawings."

The truth is that Huxley was one of those all-round men who would have succeeded in almost any walk in life. In literature his wit, his power of clear description and his admirable style would certainly have placed him in the front rank.

He was as ready with his pencil as with his pen. Every one who attended his lectures will remember how admirably they were illustrated by his blackboard sketches, and how the diagrams seemed to grow line by line almost of themselves. Drawing was, indeed, a joy to him, and when I have been sitting with him at Royal Commissions or on committees, he was constantly making comical sketches on scraps of paper or on blotting-books which, though admirable, never seemed to distract his attention from the subject on hand.

Again, he was certainly one of the most effective speakers of the day. Eloquence is a great gift, although I am not sure that the country might not be better governed and more wisely led if the House of Commons and the country were less swayed by it. There is no doubt, however, that, to its fortunate possessor, eloquence is of great value, and if circumstances had thrown Huxley into political life, no one can doubt that he would have taken high rank among our statesmen. Indeed, I believe his presence in the House of Commons would have been of inestimable value to the country. Mr. Hutton, of the *Spectator*—no mean judge—has told us that in his judgment "an abler and more accomplished debater was not to be found even in the House of Commons." His speeches had the same quality, the same luminous style of exposition, with which his printed books have made all readers in America and England familiar. Yet it had more than that. You could not listen to him without thinking more of the speaker than of his science, more of the solid, beautiful nature than of the intellectual gifts, more of his manly simplicity and sincerity than of all his knowledge and his long services. His Friday evening lectures at the Royal Institution rivalled those of Tyndall in their interest and brilliance, and were always keenly and justly popular. Yet, he has told us that at first he had almost every fault a speaker could have. After his first Royal Institution lecture he received an anonymous letter recommending him never to try

again, as whatever else he might be fit for, it was certainly not for giving lectures. It is also said that after one of his first lectures, "On the relations of Animals and Plants," at a suburban Athenæum, a general desire was expressed to the Council that they would never invite that young man to lecture again. Quite late in life he told me, and John Bright said the same thing, that he was always nervous when he rose to speak, though it soon wore off when he warmed up to his subject.

No doubt easy listening on the part of the audience means hard working and thinking on the part of the lecturer, and, whether for the cultivated audience at the Royal Institution or for one to working men, he spared himself no pains to make his lectures interesting and instructive. There used to be an impression that Science was something up in the clouds, too remote from ordinary life, too abstruse and too difficult to be interesting; or else, as Dickens ridiculed it in *Pickwick*, too trivial to be worthy of the time of an intellectual being.

Huxley was one of the foremost of those who brought our people to realise that science is of vital importance in our life, that it is more fascinating than a fairy tale, more thrilling than a novel, and that any one who neglects to follow the triumphant march of discovery, so startling in its marvellous and unexpected surprises, so inspiring in its moral influence and its revelations of the beauties and wonders of the world in which we live and the universe of which we form an infinitesimal, but to ourselves at any rate, an all important part, is deliberately rejecting one of the greatest comforts and interests of life, one of the greatest gifts with which we have been endowed by Providence.

But there is a time for all things under the sun, and we cannot fully realise the profound interest and serious responsibilities of life unless we refresh the mind and allow the bow to unbend. Huxley was full of humour, which burst out on most unexpected occasions. I remember one instance during a paper on the habits of spiders. The female spider appears to be one of the most unsocial, truculent and bloodthirsty of her sex. Even under the influence of love, she does but temporarily suspend her general hatred of all living beings. The courtship varies in character in different species, and is excessively quaint and curious; but at the close the thirst for blood which has been temporarily overmastered by an even stronger passion, bursts out with irresistible fury, she attacks her lover and, if he be not on the watch and does not succeed in making his escape, ends by destroying and sucking him dry. In moving a vote of thanks to the author, Huxley ended some interesting remarks by the observation that this closing scene was the most extraordinary form of marriage settlements of which he had ever heard.

He seemed also to draw out the wit of others. At the York "Jubilee" meeting of the British Association, he and I strolled down in the afternoon to the Minster. At the entrance we met Prof. H. J. Smith, who made a mock movement of surprise. Huxley said "you seem surprised to see me here." "Well," said Smith hesitatingly, "not exactly, but it would have been on one of the pinnacles, you know."

His letters were full of fun. Speaking of Siena in one of his letters, contained in Mr. Leonard Huxley's excellent *Life of his father*, he says: "The town is the quaintest place imaginable, built of narrow streets on several hills to start with, and then apparently stirred up with a poker to prevent monotony of effect."

And, again, writing from Florence:—

"We had a morning at the Uffizii the other day, and came back with minds enlarged and backs broken. To-morrow we contemplate attacking the Pitti, and doubt not the result will be similar. By the end of the week our minds will probably be so large, and the small of the back so small, that we should probably break if we stayed any longer, so think it prudent to be off to Venice."

By degrees public duties and honours accumulated on him more and more. He was Secretary, and afterwards President, of the Royal Society, President of the Geological and of the Ethnological Societies, Hunterian Professor from 1863 to 1870, a Trustee of the British Museum, Dean of the Royal College of Science, President of the British Association, Inspector of Fisheries, Member of Senate of the University of London, Member of no less than ten Royal Commissions, in addition to which he gave many lectures at the Royal Institution and elsewhere, besides, of course, all those which formed a part of his official duties.

In 1892 he was made a Member of the Privy Council, an unwonted but generally welcome recognition of the services which science renders to the community.

As already mentioned, he was elected a Fellow of the Royal Society in 1851. He received a Royal Medal in 1852, the Copley in 1888, and the Darwin Medal in 1894.

Apart from his professional and administrative duties, Huxley's work falls into three principal divisions—Science, Education and Metaphysics.

SCIENTIFIC WORK.

Huxley's early papers do not appear to have in all cases at first received the consideration they deserved. The only important one which was published before his return was the one "On the Anatomy and Affinities of the Family of the Medusæ."

After his return, however, there was a rapid succession of valuable Memoirs, the most important, probably, being those on Salpa and Pyrosoma, on Appendicularia and Doliolum and on the Morphology of the Cephalous Mollusca.

In recognition of the value of these Memoirs he was elected a Fellow of the Royal Society in 1851, and received a Royal Medal in 1852. Lord Rosse, in presenting it, said: "In these papers you have for the first time fully developed their (the Medusæ) structure, and laid the foundation of a rational theory for their classification." "In your second paper, 'On the Anatomy of Salpa and Pyrosoma' the phenomena, &c., have received the most ingenious and elaborate elucidation, and have given rise to a process of reasoning the results of which can scarcely yet be anticipated, but must bear, in a very important degree, upon some of the most abstruse points of what may be called transcendental physiology."

A very interesting result of his work on the Hydrozoa was the generalisation that the two layers in the bodies of Hydrozoa (Polyps and Sea Anemones), the Ectoderm and the Entoderm correspond with the two primary germ layers of the higher animals. Again, though he did not discover or first define protoplasm, he took no small share in making its importance known, and in bringing naturalists to recognise it as the physical basis of life, and in demonstrating the unity of animal and plant protoplasm.

Among other important memoirs may be mentioned those "On the Teeth and the Corpuscula Tactus," "On the Tegumentary Organs," "Review of the Cell Theory," "On Aphid," and many others.

His palæontological work, for which he has told us that at first "he did not care," began in 1855. That "On the Anatomy and Affinities of the Genus Pterygotus" is still a classic; in another, "On the Structure of the Shields of Pteraspis," and in one "On Cephalaspis" in 1858 he for the first time clearly established their vertebrate character; his work "On Devonian Fishes" in 1861 threw quite a new light on their affinities; and amongst other later papers may be mentioned that "On Hyperodapedon"; "On the Characters of the Pelvis," "On the Crayfish," and one botanical memoir, "On the Gentians," the outcome of one of his Swiss trips.

One of the most striking results of his palæontological work was the clear demonstration of the numerous and close affinities between Reptiles and Birds, the result of which is that they are regarded by many as forming together a separate group, the Sauropsida; while the Amphibia, long regarded as Reptiles, were separated from them and united with Fishes under the title of Ichthyopsida. At the same time he showed that the Mammalia were not derived from the Sauropsida, but formed two diverging lines springing from a common ancestor. And besides this great generalisation, says the Royal Society obituary notice, "the importance of which, both from a classificatory and from an evolutionary point of view, needs no comment, there came out of the same researches numerous lesser contributions to the advancement of morphological knowledge, including, among others, an attempt, in many respects successful, at a classification of birds."

In conjunction with Tyndall, he communicated to the *Philosophical Transactions* a memoir on glaciers, and his interest in philosophical geography was also shown in his popular treatise on physiography.

But it would be impossible here to go through all his contributions to science. The Royal Society Catalogue enumerates more than a hundred, everyone of which, in the words of Prof. S. Parker, "contains some brilliant generalisation, some new and fruitful way of looking at the facts of science. The keenest morphological insight and inductive power are everywhere apparent;

but the imagination is always kept well in hand, and there are none of those airy speculations—a liberal pound of theory to a bare ounce of fact—by which so many reputations have been made." Huxley never allowed his study of detail to prevent him from taking a wide general view.

I now come to his special work on Man.

In the "Origin of Species," Darwin did not directly apply his views to the case of Man. No doubt he assumed that the considerations which applied to the rest of the animal kingdom must apply to Man also, and I should have thought must have been clear to every one, had not Wallace been in some respects, much to my surprise, of a different opinion. At any rate, it required some courage to state this boldly, and much skill and knowledge to state it clearly.

He put it in a manner which was most conclusive, and showed, in Virchow's words, "that in respect of substance and structure Man and the lower animals are one. The fundamental correspondence of human organisation with that of animals is at present universally accepted."

This, I think, is too sweeping a proposition. It may be true for Germany, but it certainly is not true here. Many of our countrymen and countrywomen not only do not accept, they do not even understand, Darwin's theory. They seem to suppose him to have held that Man was descended from one of the living Apes. This, of course, is not so. Man is not descended from a Gorilla or an Orang-utang, but Man, the Gorilla, the Orang-utang and other Anthropoid Apes are all descended from some far away ancestor.

"A Pliocene Homoskeleton," Huxley said, "might analogically be expected to differ no more from that of modern men than the *Canis canis* from modern Canes, or Pliocene horses from modern horses. If so, he would most undoubtedly be a man—genus Homo—even if you made him a distinct species. For my part, I should by no means be astonished to find the genus Homo represented in the Miocene, say, the Neanderthal man, with rather smaller brain capacity, longer arms, and more movable great toe, but at most specifically different."

In his work "On Man's Place in Nature," while referring to the other higher Quadrumana, Huxley dwelt principally on the chimpanzee and the gorilla, because, he said, "It is quite certain that the ape, which most nearly approaches man in the totality of its organisation, is either the chimpanzee or the gorilla."

This is no doubt the case at present; but the gibbons (Hylobates), while differing more in size, and modified in adaptation to their more skilful power of climbing, must also be considered, and, to judge from Prof. Dubois' remarkable discovery in Java of Pithecanthropus, which half the authorities have regarded as a small man, and half as a large gibbon, it is rather down to Hylobates than either the chimpanzee or the gorilla that we shall have to trace the point where the line of our far-away ancestors will meet that of any existing genus of monkeys.

Huxley emphasised the fact that monkeys differ from one another in bodily structure as much or more than they do from man.

We have Haeckel's authority for the statement that, "after Darwin had, in 1859, reconstructed this most important biological theory, and by his epoch-making theory of natural selection placed it on an entirely new foundation, Huxley was the first who extended it to man; and in 1863, in his celebrated three lectures on 'Man's Place in Nature,' admirably worked out its most important developments."

The work was so well and carefully done that it stood the test of time, and writing many years afterwards Huxley was able to say, and to say truly, that

"I was looking through 'Man's Place in Nature' the other day; I do not think there is a word I need delete, nor anything I need add except in confirmation and extension of the doctrine there laid down. That is great good fortune for a book thirty years old, and one that a very shrewd friend of mine implored me not to publish, as it would certainly ruin all my prospects" ("Life of Prof. Huxley," p. 344).

He has told us elsewhere ("Collected Essays," vii. p. xi.) that "it has achieved the fate which is the Euthanasia of a scientific work, of being inclosed among the rubble of the foundations of knowledge and forgotten." He has, however, himself saved it from the tomb, and built it into the walls of the temple of science, and it will still well repay the attention of the student.

For a poor man—I mean poor in money, as Huxley was all

his life—to publish such a book at that time was a bold step. But the prophecy with which he concluded the work is coming true.

"After passion and prejudice have died away," he said, "the same result will attend the teachings of the naturalist respecting that great Alps and Andes of the living world—Man. Our reverence for the nobility of manhood will not be lessened by the knowledge that man is, in substance and in structure, one with the brutes; for he alone possesses the marvellous endowments of intelligible and rational speech, whereby, in the secular period of his existence, he has slowly accumulated and organised the experience which is almost wholly lost with the cessation of every individual life in other animals; so that now he stands raised upon it as on a mountain top—far above the level of his humble fellows, and transfigured from his grosser nature by reflecting here and there a ray from the infinite source of truth" ("Collected Essays," vii. p. 155).

Another important research connected with the work of our Society was his investigation of the structure of the vertebrate skull. Owen had propounded a theory and worked it out most ingeniously that the skull was a complicated elaboration of the anterior part of the backbone; that it was gradually developed from a preconceived idea or archetype; that it was possible to make out a certain number of vertebræ, and even the separate parts of which they were composed.

Huxley maintained that the archetypal theory was erroneous; and that instead of being a modification of the anterior part of the primitive representative of the backbone, the skull is rather an independent growth around and in front of it. Subsequent investigations have strengthened this view, which was now generally accepted. This lecture marked an epoch in vertebrate morphology, and the views he enunciated still hold the field.

One of the most interesting parts of Huxley's work, and one specially connected with our Society, was his study of the ethnology of the British Isles. It has also an important practical and political application, because the absurd idea that ethnologically the inhabitants of our islands form three nations—the English, Scotch and Irish—has exercised a malignant effect on some of our statesmen, and is still not without influence on our politics. One of the strongest arguments put forward in favour of Home Rule used to be that the Irish were a "nation." In 1887 I attacked this view in some letters to the *Times*, subsequently published by Quaritch. Nothing is more certain than that there was not a Scot in Scotland till the seventh century; that the east of our island from John o' Groat's House to Kent is Teutonic; that the most important ethnological line, so far as there is one at all, is not the boundary between England and Scotland, but the north and south watershed which separates the East and West. In Ireland, again, the population is far from homogeneous. Huxley strongly supported the position I had taken up. "We have," he said, "as good evidence as can possibly be obtained on such subjects that the same elements have entered into the composition of the population in England, Scotland and Ireland; and that the ethnic differences between the three lie simply in the general and local proportions of these elements in each region. . . . The population of Cornwall and Devon has as much claim to the title of Celtic as that of Tipperary. . . . Undoubtedly there are four geographical regions, England, Scotland, Wales and Ireland, and the people who live in them call themselves and are called by others the English, Scotch, Welsh and Irish nations. It is also true that the inhabitants of the Isle of Man call themselves Manxmen, and are just as proud of their nationality as any other 'nationalities.'

"But if we mean no more than this by 'nationality,' the term has no practical significance" ("The Races of the Brit. Isles," pp. 44, 45).

Surely it would be very desirable, especially when political arguments are based on the term, that we should come to some understanding as to what is meant by the word 'nation.' The English, Scotch and Irish live under one Flag, one Queen, and one Parliament. If they are not one nation, what are they? What term are we to use, and some term is obviously required, to express and combine all three. For my part I submit that the correct terminology is to speak of Celtic race or Teutonic race, of the Irish people or the Scotch people; but that the people of England, Scotland and Ireland, aye, and of the Colonies also, constitute one great nation.

As regards the races which have combined to form the nation, Huxley's view was that in Roman times the population of

Britain comprised people of two types, the one fair, the other dark. The dark people resembled the Aquitani and the Iberians; the fair people were like the Belgic Gauls ("Essays," V. vii. p. 254). And he adds that "the only constituent stocks of that population, now, or at any other period about which we have evidence, are the dark whites, whom I have proposed to call 'Melanochroi' and the fair whites or 'Xanthochroi.'"

He concludes (1) "That the Melanochroi and the Xanthochroi are two separate races in the biological sense of the word race; (2) that they have had the same general distribution as at present from the earliest times of which any record exists on the continent of Europe; (3) that the population of the British Islands is derived from them, and from them only.

It will, however, be observed that we have (1) a dark race and a fair race; (2) a large race and a small race; and (3) a round-headed race and a broad-headed race. But some of the fair race were large, some small; some have round heads, some long heads; some of the dark race again had long heads, some round ones. In fact, the question seems to me more complicated than Huxley supposed. The Mongoloid race extend now from China to Lapland; but in Huxley's opinion they never penetrated much further West, and never reached our islands. "I am unable," he says, "to discover any ground for believing that a Lapp element has ever entered into the population of these islands." It is true that we have not, so far as I know, anything which amounts to proof. We know, however, that all the other animals which are associated with the Lapps once inhabited Great Britain. Was man the only exception? I think not, more especially when we find, not only the animals of Lapland, but tools and weapons identical with those of the Lapps. I must not enlarge on this, and perhaps I may have an opportunity of laying my views on the subject more fully before the Society; but I may be allowed to indicate my own conclusion, namely, that the races to which Huxley refers are amongst the latest arrivals in our islands; that England was peopled long before its separation from the mainland, and that after the English Channel was formed, successive hordes of invaders made their way across the sea, but as they brought no women, or but few, with them, they exterminated the men, or reduced them to slavery, and married the women. Thus through their mothers our countrymen retain the strain of previous races, and hence perhaps we differ so much from the populations across the silver streak.

Summing up this side of Huxley's work, Sir M. Foster has truly said that, "whatever bit of life he touched in his search, protozoan, polyp, mollusc, crustacean, fish, reptile, beast and man—and there were few living things he did not touch—he shed light on it, and left his mark. There is not one, or hardly one, of the many things which he has written which may not be read again to-day with pleasure and with profit, and not once or twice only in such a reading, it will be felt that the progress of science has given to words written long ago a strength and meaning even greater than that which they seemed to have when first they were read."

In 1870, Huxley became a member of the first London School Board, and though his health compelled him to resign early in 1872, it would be difficult to exaggerate the value of the service he rendered to London and, indeed, to the country generally.

The education and discipline which he recommended were:—

- (1) Physical training and drill.
- (2) Household work or domestic economy, especially for girls.
- (3) The elementary laws of conduct.
- (4) Intellectual training, reading, writing and arithmetic, elementary science, music and drawing.

He maintained that "no boy or girl should leave school without possessing a grasp of the general character of science, and without having been disciplined more or less in the methods of all sciences."

As regards the higher education, he was a strong advocate for science and modern languages, though without wishing to drop the classics.

Some years ago, for an article on higher education, I consulted a good many of the highest authorities on the number of hours per week which in their judgment should be given to the principal subjects. Huxley, amongst others, kindly gave me his views. He suggested 10 hours for ancient languages and literature, 10 for modern languages and literature, 8 for arithmetic and mathematics, 8 for science, 2 for geography, and 2 for religious instruction.

For my own part I am firmly convinced that the amount of

time devoted to classics has entirely failed in its object. The mind is like the body—it requires change. Mutton is excellent food; but mutton for breakfast, mutton for lunch, and mutton for dinner would soon make any one hate the sight of mutton, and so Latin grammar before breakfast, Latin grammar before lunch, and Latin grammar before dinner is enough to make almost any one hate the sight of a classical author. Moreover, the classics, though an important part, are not the whole of education, and a classical scholar, however profound, if he knows no science, is but a half-educated man after all.

In fact, Huxley was no opponent of a classical education in the proper sense of the term, but he did protest against it in the sense in which it is usually employed, namely, as an education from which science is excluded, or represented only by a few random lectures.

He considered that specialisation should not begin till sixteen or seventeen. At present we begin in our Public School system to specialise at the very beginning, and to devote an overwhelming time to Latin and Greek, which, after all, the boys are not taught to speak. Huxley advocated the system adopted by the founders of the University of London, and maintained to the present day that no one should be given a degree who did not show some acquaintance with science and with at least one modern language.

"As for the so-called 'conflict of studies,'" he exclaims, "one might as well inquire which of the terms of a Rule of Three sum one ought to know in order to get a trustworthy result. Practical life is such a sum, in which your duty multiplied into your capacity, and divided by your circumstances, gives you the fourth term in the proportion, which is your deserts, with great accuracy" ("Life of Prof. Huxley," p. 406).

"That man," he said, "I think, has had a liberal education, who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order; ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of nature and the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of nature or of art, to hate all vileness and to respect others as himself."

He was also strongly of opinion that colleges should be places of research as well as of teaching.

"The modern university looks forward, and is a factory of new knowledge; its professors have to be at the top of the wave of progress. Research and criticism must be the breath of their nostrils; laboratory work the main business of the scientific student; books his main helpers.

Education has been advocated for many good reasons: by statesmen because all have votes, by Chambers of Commerce because ignorance makes bad workmen, by the clergy because it makes bad men, and all these are excellent reasons; but they may all be summed up in Huxley's words that "the masses should be educated because they are men and women with unlimited capacities of being, doing and suffering, and that it is as true now as ever it was that the people perish for lack of knowledge."

Huxley once complained to Tyndall, in joke, that the clergy seemed to let him say anything he liked, "while they attack me for a word or a phrase." But it was not always so.

Tyndall and I went, in the spring of 1874, to Naples to see an eruption of Vesuvius. At one side the edge of the crater shelved very gradually to the abyss, and, being anxious to obtain the best possible view, I went a little over the ridge. In the autumn Tyndall delivered his celebrated address to the British Association at Belfast. This was much admired, much read, but also much criticised, and one of the papers had an article on Huxley and Tyndall, praising Huxley very much at Tyndall's expense, and ending with this delightful little bit of bathos:—"In conclusion, we do not know that we can better illustrate Prof. Tyndall's foolish recklessness, and the wise, practical character of Prof. Huxley, than by mentioning the simple fact that last spring, at the very moment when Prof. Tyndall foolishly entered the crater of Vesuvius during an eruption, Prof. Huxley, on the contrary, took a seat on the London School Board."

Tyndall, however, returned from Naples with fresh life and

health, while the strain of the School Board told considerably on Huxley's health.

Huxley's attitude on the School Board with reference to Bible teaching came as a surprise to those who did not know him well. He supported Mr. W. H. Smith's motion in its favour, which indeed was voted for by all the members except six, three of whom were the Roman Catholics, who did not vote either way.

"I have been," he said, "seriously perplexed to know by what practical measures the religious feeling, which is the essential basis of conduct, was to be kept up, in the present utterly chaotic state of opinion on these matters, without the use of the Bible. Take the Bible as a whole; make the severest deductions which fair criticism can dictate for shortcomings and positive errors; eliminate, as a sensible lay-teacher would do if left to himself, all that it is not desirable for children to occupy themselves with; and there still remains in this old literature a vast residuum of moral beauty and grandeur. And then consider the great historical fact that for three centuries this book has been woven into the life of all that is best and noblest in English history; that it has become the national epic of Britain, and is as familiar to noble and simple, from John o' Groat's House to Land's End, as Dante and Tasso were once to Italians; that it is written in the noblest and purest English, and abounds in exquisite beauties of mere literary form; and, finally, that it forbids the veriest hind who never left his village to be ignorant of the existence of other countries and other civilisations, and of a great past, stretching back to the furthest limits of the oldest nations in the world. By the study of what other book could children be so much humanised and made to feel that each figure in that vast historical procession fills, like themselves, but a momentary space in the interval between two eternities, and earns the blessings or the curses of all time, according to its effort to do good and hate evil, even as they also are earning their payment for their work?"

(To be continued).

THE NUMBERS OF THE AMERICAN BISON.

IT is eleven years since Mr. Hornaday published his interesting account of the extermination of the American Bison—a work that was fully noticed in these columns at the time. The author then estimated the number of living survivors of the species at 1091, of which 256 were in captivity and 835 running wild in British North America, the Yellowstone Park, and a few other localities. Recently Mr. Mark Sullivan has attempted to make a fresh census of the species, the results of which form the subject of a long article published in the *Boston Evening Transcript* of October 10.

As the result of his inquiries, Mr. Sullivan estimates the number of bison living at the present time as approximately 1024, of which 684 are in captivity and 340 running wild or half wild. His investigations appear to have been conducted with great care; and in the case of the greater number of domesticated herds—whether American or foreign—the numbers are practically accurate. The number of those running wild in the neighbourhood of the Great Slave Lake has, however, been arrived at by a process of "averaging;" and the extent of the herd in the Yellowstone is to a large degree a matter of guess-work. Another element of uncertainty is introduced by the alleged existence of wild bison in the mountains of Colorado; for while a Government official vouches for their occurrence in considerable numbers, old bison-hunters are very sceptical whether there are any at all. Admitting that the report of their existence in this district may be true, the author allows 21 as their conjectural number. He adds that reports of wild bison in other parts of the United States are pure fabrications.

The largest herd of pure-bred domesticated bison living in the United States is one belonging to the heirs of the late Mr. C. Allard, which ranges over the Flathead Indian Reserve in Montana, and numbers 259 head. Next to this comes the herd of Mr. Jones Goodnight, in Armstrong County, Texas, with a total of 110 head. The number living in countries other than America is given at 100, of which 26 are in England, the Duke of Bedford's herd of 12 at Woburn Abbey being probably the largest in this country.

Whatever may be the real number of wild bison, it is evident from the figures given above that they have decreased very seriously since 1887, while those living in captivity exhibit, on